# Exhibit 12

Trials@uspto.gov
571-272-7822

Paper 51
Entered: November 8, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

APPLE, INC.,
Petitioner,

v.

COREPHOTONICS LTD.,
Patent Owner.

---

IPR2020-00905
Patent 10,225,479 B2

---

Before BRYAN F. MOORE, JOHN F. HORVATH, and MONICA S. ULLAGADDI, *Administrative Patent Judges.*

HORVATH, *Administrative Patent Judge*.

# JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
*35 U.S.C. § 318(a)*

# I. INTRODUCTION

## *A. Background and Summary*

Apple, Inc. ("Petitioner") filed a Petition requesting *inter partes* review of claims 1–16, 18, 23–38, and 40 ("the challenged claims") of U.S. Patent No. 10,225,479 B2 (Ex. 1001, "the '479 patent"). Paper 3 ("Pet."), 9. Corephotonics Ltd. ("Patent Owner") filed a Preliminary Response. Paper 8 ("Prelim. Resp."). Upon consideration of the Petition and Preliminary Response, we instituted *inter partes* review of all challenged claims on all grounds raised. Paper 10 ("Dec. Inst.").

Patent Owner filed confidential (Paper 15) and public (Paper 39) versions of its Response to the Petition. *See* Paper 39 ("PO Resp.").[1] Petitioner filed confidential (Paper 24) and public (Paper 40) versions of a Reply. *See* Paper 40 ("Pet. Reply"). Patent Owner filed a Sur-Reply. *See* Paper 32 ("PO Sur-Reply"). An oral hearing was held on August 12, 2021, and the hearing transcript is included in the record. *See* Paper 49 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(b). This is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we find Petitioner has failed to show by a preponderance of evidence that claims 1–16, 18, 23–38, and 40 of the '479 patent are unpatentable on the grounds raised in the Petition.

[1] Unless otherwise noted, we cite to the public versions of the papers in this proceeding. Earlier public versions of Patent Owner's Response (Paper 16) and Petitioner's Reply (Paper 23) were rejected for redacting more information than needed to protect Patent Owner's confidentiality interest. *See* Paper 30, 7–8; Paper 31, 3–4.

*B. Real Parties-in-Interest*

Petitioner and Patent Owner identify themselves, respectively, as the real parties-in-interest. Pet. 1; Paper 5, 1.

*C. Related Matters*

Petitioner and Patent Owner identify *Corephotonics Ltd. v. Apple Inc.*, 5:19-cv-04809 (N.D. Cal.), as a district court proceeding that can affect or be affected by this proceeding, and Petitioner also identifies IPR2020-00906 as an *inter partes review* that can affect or be affected by this proceeding. Pet. 1; Paper 5, 1. In addition, we note that the '479 patent is part of a family of patents and patent applications that include at least U.S. Patent Nos. 10,326,942; 10,015,408; 9,661,233; and 9,185,291. Ex. 1001, code (63). Many of these patents were or currently are involved in *inter partes* review proceedings that could affect or be affected by a decision in this proceeding.

*D. Evidence Relied Upon*[2]

| Reference | | Effective Date | Exhibit |
|---|---|---|---|
| Parulski | US 7,859,588 B2 | Dec. 28, 2010 | 1005 |
| Richard Szeliski, *Computer Vision Algorithms and Applications*, 468–503 (2011) ("Szeliski") | | 2011 | 1013 |
| Konno[3] | JP 2013/106289 A | May 30, 2013 | 1015 |
| Stein | US 8,908,041 B2 | Feb. 7, 2013[4] | 1023 |

[2] Petitioner also relies upon the Declarations of Fredo Durand, Ph.D. (Exs. 1003, 1038) and José Sasián, Ph.D. (Ex. 1021).

[3] Konno is a certified translation of a Japanese Patent Application originally published in Japanese. *See* Ex. 1015, 34–59.

[4] Petitioner identifies Stein as prior art under 35 U.S.C. § 102(a)(2) based on the February 7, 2013 filing date of a provisional application to which Stein claims priority. *See* Pet. 9. Patent Owner does not dispute this. *See* PO Resp. 1–47.

| Reference | | Effective Date | Exhibit |
|---|---|---|---|
| Segall | US 8,406,569 B2 | Mar. 26, 2013 | 1024 |

*E. Instituted Grounds of Unpatentability*

We instituted review on the following grounds:

| Ground | Claims | 35 U.S.C. § | References |
|---|---|---|---|
| 1 | 1, 10–14, 16, 18, 23, 32–36, 38, 40 | 103(a) | Parulski, Konno |
| 2 | 2–4, 24–26 | 103(a) | Parulski, Konno, Szeliski |
| 3 | 5–9, 27–31 | 103(a) | Parulski, Konno, Szeliski, Segall |
| 4 | 15, 37 | 103(a) | Parulski, Konno, Stein |

## II. ANALYSIS

*A. The '479 Patent*

The '479 patent is directed to "a thin (e.g., fitting in a cell-phone) dual-aperture zoom digital camera with fixed focal length lenses" that is configured to use "partial or full fusion to provide a fused image in still mode." Ex. 1001, 3:18–23. Figure 1A, reproduced below, illustrates a dual-aperture zoom digital camera 100.

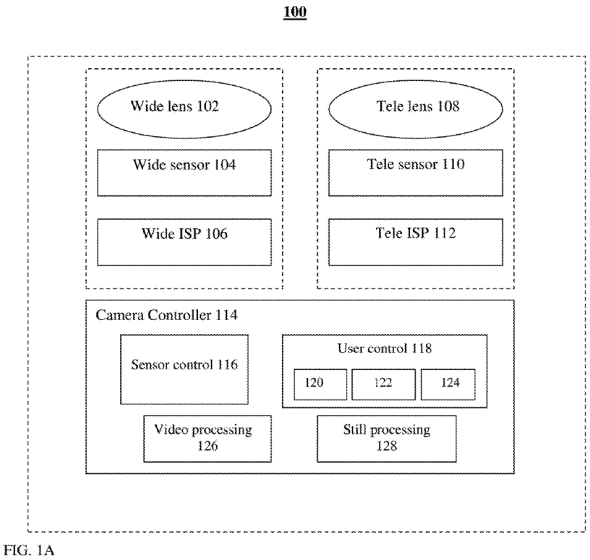


FIG. 1A

Figure 1A is a "block diagram illustrating a dual-aperture zoom" digital camera 100. *Id.* at 5:64–65. Camera 100 includes a wide imaging

subsystem consisting of wide lens 102, wide sensor 104, and wide image signal processor ("ISP") 106, and a tele imaging subsystem consisting of tele lens 108, tele sensor 110, and tele ISP 112. *Id.* at 6:24–29.

Camera 100 also includes controller 114, which includes sensor control 116, user control 118, video processing module 126 and still processing module 128. *Id.* at 6:33–37. User control 118 controls various camera functions, including, operational mode 120, region of interest ("ROI") 122, and zoom factor ("ZF") 124. *Id.* at 6:38–40. Zoom factor 124 allows a user "to choose a zoom factor." *Id.* at 6:50–51. Sensor control 116 chooses "which of the sensors is operational" based on the selected zoom factor. *Id.* at 6:41–45. ROI function 122 allows a user to "choose a region of interest," i.e., a sub-region "on which both sub-cameras are focused." *Id.* at 6:46–50.

The dual lenses allow camera 100 to take an image having a shallow depth-of-field ("DOF") "by taking advantage of the longer focal length of the Tele lens." *Id.* at 4:23–27. The image taken with the Tele lens can be enhanced "by fusing data from an image captured simultaneously with the Wide lens." *Id.* at 4:27–30. For example, the Tele lens can focus "on a subject of the photo" and the Wide lens can focus on "a closer distance than the subject so that objects behind the subject appear very blurry." *Id.* at 4:30–34. Then, a shallow depth-of-field image can be formed when "information from the out-of-focus blurred background in the Wide image is fused with the original Tele image background information, providing a blurrier background and even shallower DOF." *Id.* at 4:34–38.

The process for fusing images taken with the Wide and Tele lenses is shown in Figure 5 of the '479 patent, which is reproduced below.

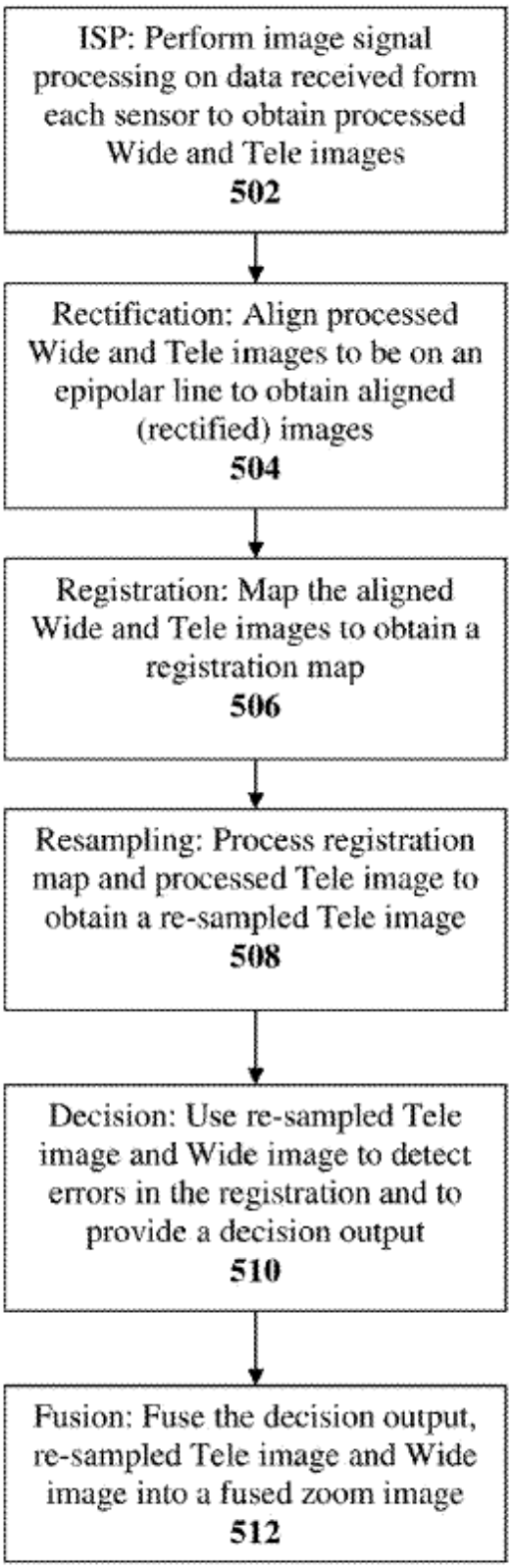
ISP: Perform image signal processing on data received form each sensor to obtain processed Wide and Tele images
502
Rectification: Align processed Wide and Tele images to be on an epipolar line to obtain aligned (rectified) images
504
Registration: Map the aligned Wide and Tele images to obtain a registration map
506
Resampling: Process registration map and processed Tele image to obtain a re-sampled Tele image
508
Decision: Use re-sampled Tele image and Wide image to detect errors in the registration and to provide a decision output
510
Fusion: Fuse the decision output, re-sampled Tele image and Wide image into a fused zoom image
512

Figure 5 is a flow chart depicting a method for acquiring a zoom image in a dual lens camera. *Id.* at 9:39–40. At step 502, separate images are captured by each of the Wide and Tele lenses. *Id.* at 9:40–44. At step 504, these images are aligned on an epipolar line. *Id.* at 9:46–47. At step 506, a registration map is generated. *Id.* at 9:47–49. At step 508, the registration map is used to resample the Tele image. *Id.* at 9:50–51. At step 510, Tele image pixel values are compared to Wide image pixel values, and if a significant difference is detected, the Wide image pixel values are chosen for the output image. *Id.* at 9:51–58. Finally, at step 512, a fused image is generated from the re-sampled Tele image and the Wide image. *Id.* at 9:58–60. The '906 patent discloses that by "register[ing] Tele image pixels to a matching pixel set within the Wide image pixels, . . . the output image will retain the Wide POV" or point-of-view. *Id.* at 5:23–26.

*B. Illustrative Claims*

Of the challenged claims, claims 1 and 23 are independent and substantially similar in scope. Claim 1 recites a dual-aperture digital camera configured to generate a fused image from images taken with wide angle and telephoto lenses, and claim 23 recites a method for generating such a fused image using a dual-aperture digital camera. *Compare* Ex. 1001, 13:22–50, *with id.* at 15:49–67. The remaining challenged claims depend directly or indirectly from claims 1 or 23. Claim 1 is illustrative of the challenged claims and is reproduced below.

> 1. A dual-aperture digital camera for imaging an object or scene, comprising:
>
> a) a Wide camera comprising a Wide lens and a Wide image sensor, the Wide camera having a respective field of view

> $FOV_W$ and being operative to provide a Wide image of the object or scene;
>
> b) a Tele camera comprising a Tele lens and a Tele image sensor, the Tele camera having a respective field of view $FOV_T$ narrower than $FOV_W$ and being operative to provide a Tele image of the object or scene, wherein the Tele lens has a respective effective focal length $EFL_T$ and total track length $TTL_T$ fulfilling the condition $EFL_T / TTL_T > 1$;
>
> c) a first autofocus (AF) mechanism coupled mechanically to, and used to perform an AF action on the Wide lens;
>
> d) a second AF mechanism coupled mechanically to, and used to perform an AF action on the Tele lens; and
>
> e) a camera controller operatively coupled to the first and second AF mechanisms and to the Wide and Tele image sensors and configured to control the AF mechanisms and to process the Wide and Tele images to create a fused image,
>
> wherein areas in the Tele image that are not focused are not combined with the Wide image to create the fused image and
>
> wherein the camera controller is further operative to output the fused image with a point of view (POV) of the Wide camera by mapping Tele image pixels to matching pixels within the Wide image.

*Id.* at 13:22–50.

*C. Level of Ordinary Skill in the Art*

Petitioner identifies a person of ordinary skill in the art ("POSITA") at the time of the invention as someone that would have had "a bachelor's or the equivalent degree in electrical and/or computer engineering or a related field and 2-3 years of experience in imaging systems including image processing and lens design." Pet. 6 (citing Ex. 1003 ¶ 13). In our Institution Decision, we adopted this description as our own. *See* Dec. Inst. 11–12.

Neither party disputes that preliminary finding, which we maintain for purposes of this decision. *See* PO Resp. 3–4; Pet. Reply 1–27.

*D. Claim Construction*

In *inter partes* reviews, we interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2019). Under this standard, a claim is construed "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.* Only claim terms which are in controversy need to be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

In the Institution phase of this proceeding, Petitioner proposed a construction for a "fused image with a point of view (POV) of the Wide camera," which Patent Owner did not dispute. *See* Dec. Inst. 12. Therefore, we declined to expressly construe that or any other claim term. *Id.* In the current phase of this proceeding, Patent Owner disputes Petitioner's proposed construction for this term and argues Petitioner has failed to demonstrate how this limitation is met when it is properly construed. *See* PO Resp. 8–13, 29–31. Accordingly, we construe this term.

*1. Fused Image with a Point of View (POV) of the Wide Camera*

Petitioner contends this term means "a fused image that maintains the Wide camera's field of view or the Wide camera's position." Pet. 8 (emphasis omitted). Patent Owner contends it means a "fused image in which the positions and shapes of objects reflect the POV of the Wide camera." PO Resp. 13. Petitioner responds that Patent Owner's construction is unhelpful because it "fails to provide any meaning to the

construed term 'point of view (POV).'" Pet. Reply 1. Petitioner also provides an alternative construction that the term means a "fused image in which the positions or shapes of objects reflect those of the Wide camera." *Id.* at 6 (emphasis omitted). Patent Owner replies that this latter construction is new and improper and also incorrect because it "ignores that the [step of] registering pixels to matching pixels will necessarily address both position (shift) and perspective (shape)." PO Sur-Reply 2–3.

To resolve the parties' dispute, we turn to the Specification. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) ("[T]he specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term."). In relevant part, the Specification discloses:

> In a dual-aperture camera image plane, as seen by each sub-camera (and respective image sensor), a given object will be shifted and have different perspective (shape). This is referred to as point-of-view (POV). The system output image can have the shape and position of either sub-camera image or the shape or position of a combination thereof. If the output image retains the Wide image shape then it has the Wide perspective POV. If it retains the Wide camera position then it has the Wide position POV. The same applies for Tele images position and perspective. As used in this description, the perspective POV may be of the Wide or Tele sub-cameras, while the position POV may shift continuously between the Wide and Tele sub-cameras. In fused images, it is possible to register Tele image pixels to a matching pixel set within the Wide image pixels, in which case the output image will retain the Wide POV ("Wide fusion").

Ex. 1001, 5:10–26.

Petitioner argues this disclosure supports its construction because it means "'*a point of view of the Wide camera*' . . . can mean one of two things—either 'Wide perspective POV' (i.e., wide camera FOV) or 'Wide

position POV' (i.e., wide camera position)." Pet. 7 (citing Ex. 1003 ¶ 31). Patent Owner argues this disclosure teaches a camera's point-of-view "depends on the position and orientation of the camera" and "using a camera with a different POV can both shift an object (change its position in the image) and change the perspective of an object (change[] its apparent shape in the image)." PO Resp. 12 (citing Ex. 2001 ¶ 43). Thus, when the '479 patent refers to "Wide POV" it "is referring to the complete Wide POV, both perspective and position." *Id.* at 13 (citing Ex. 2001 ¶ 45).

We agree with Patent Owner. Although it is not a model of clarity, the Specification equates a camera's POV with how an object will appear in that camera's image plane, e.g., in an image taken from that camera. For example, it discloses that "a given object will be shifted and have different perspective (shape). This is referred to as point-of-view (POV)." Ex. 1001, 5:10–12. Thus, the position *and* perspective (shape) of an object in an image depends on the POV of the camera that took the image.

The Specification further discloses that a fused image[5] that "retains the Wide image shape . . . has the Wide perspective POV" and a fused image that "retains the Wide camera position . . . has the Wide position POV." *Id.* at 5:15–18. Moreover, a fused image's "perspective POV may be of the Wide . . . sub-camera[], while the position POV may shift . . . between the Wide and Tele sub-cameras." *Id.* at 5:20–23. Thus, a fused image may have the Wide perspective POV and either (a) the Wide position POV, (b) the Tele position POV, or (c) an intermediate position POV. This suggests that a fused image has a Wide POV when it has both a Wide perspective POV

[5] A "fused" image is one that "combine[s] in still mode at least some of the Wide and Tele image data." Ex. 1001, 4:49–51.

and a Wide position POV. If the fused image did not have a Wide position POV it could only be described as having a Wide perspective POV, not a Wide POV.

Figure 5 of the '479 patent, which is the only Figure that describes a method for generating a fused image, further suggests that a fused image has a Wide POV when it has both a Wide perspective POV and a Wide position POV. The method begins by aligning Wide and Tele images on an epipolar line and "mapping between the Wide and Tele aligned images . . . to produce a registration map." *Id.* at 9:46–49. Next, after a re-sampling step, "the re-sampled Tele image and the Wide image are processed to detect errors in the registration." *Id.* at 9:49–54. When an error is detected—i.e., when the "Tele image data is compared with the Wide image data and . . . the comparison detects significant dissimilarities"—the "Wide pixel values are chosen to be used in the output image." *Id.* at 9:54–58. Thus, the fused image contains only information from (a) the Wide image and (b) the Tele image that matches information from the Wide image. The fused image contains no information from the Tele image that differs from information from the Wide image, e.g., information representing the different "shape" of an object when photographed from the POV of the Tele camera. As stated in the Specification, the process of "register[ing] Tele image pixels to a *matching pixel set* within the Wide image pixels . . . will retain the Wide POV." *Id.* at 5:23–26 (emphasis added).

For the reasons discussed above, we agree with Patent Owner that a fused image having a Wide POV means a fused image in which the positions and shapes of objects reflect the POV of the Wide camera. Accordingly, we construe a fused image having a Wide POV to mean "a fused image having a Wide perspective POV and a Wide position POV."

*E. Ground 1*

Petitioner argues claims 1, 10–14, 16, 18, 23, 32–36, 38, and 40 are unpatentable as obvious over Parulski and Konno. *See* Pet. 10–41. Patent Owner disputes this. *See* PO Resp. 26–31, 35–47. For the reasons discussed below, Petitioner has failed to establish by a preponderance of evidence that claims 1, 10–14, 16, 18, 23, 32–36, 38, and 40 are unpatentable as obvious over Parulski and Konno.

*1. Parulski*

Parulski discloses "a digital camera that uses multiple lenses and image sensors to provide an improved imaging capability." Ex. 1005, 1:8–10. A schematic illustration of Parulski's camera is shown in Figure 1, which is reproduced below.

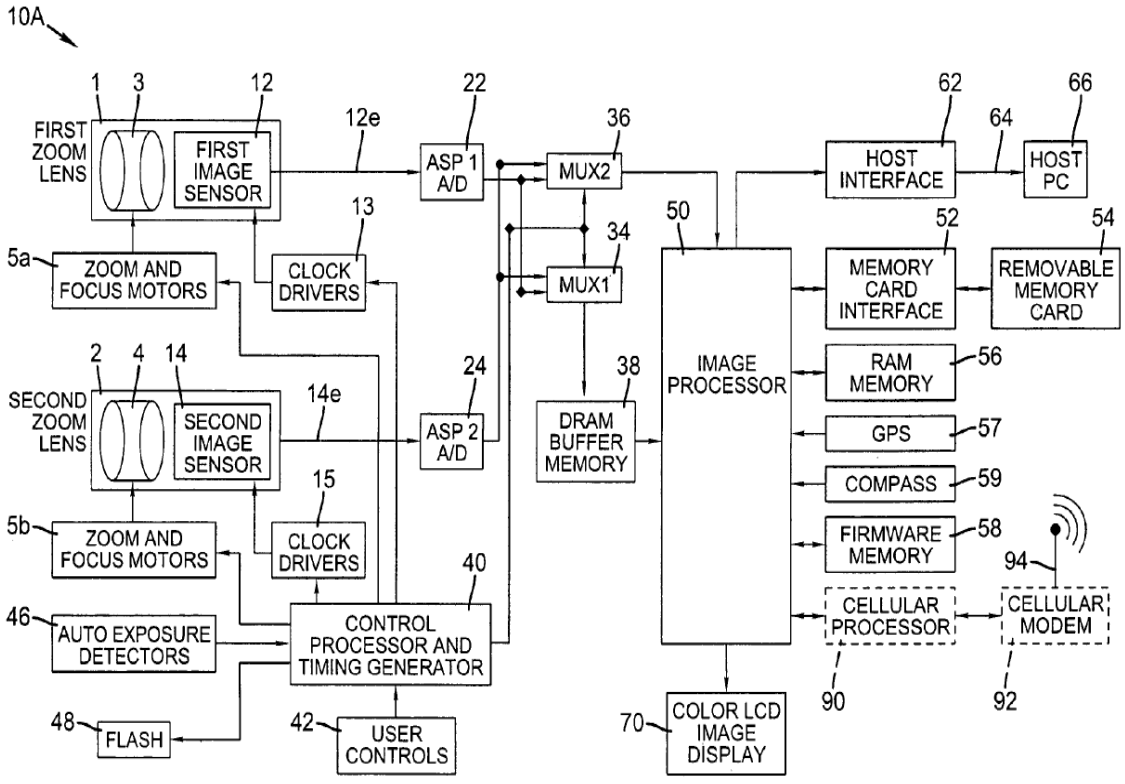


FIG. 1

with a first image sensor, and a second zoom lens with a second image sensor." *Id.* at 8:28–30.

The camera includes "two imaging stages 1 and 2, both with zoom lenses 3 and 4." *Id.* at 12:42–43. "[Z]oom lens 3 is controlled by a first lens focus adjuster, e.g., zoom and focus motors 5a, and provides an image to a first image sensor 12." *Id.* at 12:47–49. "[Z]oom lens 4 is controlled by a second lens focus adjuster, e.g., zoom and focus motors 5b, and provides an image to a second image sensor 14." *Id.* at 12:49–52. Each of zoom lenses 3 and 4 could be "replaced with a fixed focal length lens." *Id.* at 13:3–6. Image sensors 12 and 14 can "have a variety of aspect ratios" and "do not have to have the same specifications." *Id.* at 13:26–32. "[C]ontrol processor and timing generator 40 [CPT 40] controls the first image sensor 12 . . . the second image sensor 14" and "the zoom and focus motors 5a and 5b." *Id.* at 13:37–42. Analog data from image sensors 12 and 14 are digitized by analog signal processors 22 and 24, respectively, and the digitized data is supplied to each of multiplexers 34 and 36. *Id.* at 13:48–59. CPT 40 controls multiplexer 34 to select digitized data from either sensor 12 or 14 as an image signal and controls multiplexer 36 to select digitized data from the other of sensors 12 or 14 as an autofocus image signal. *Id.* at 14:1–5. Image processor 50 processes the digitized data from multiplexer 34 to produce a digital image and processes the digitized data from multiplexer 36 to calculate "focus detection signals that drive the first and second focus adjusters, that is, the zoom and focus motors 5a and 5b." *Id.* at 14:15–16.

Parulski's dual-lens camera can be used to generate a distance or range map as illustrated in Figure 11, which is reproduced below.

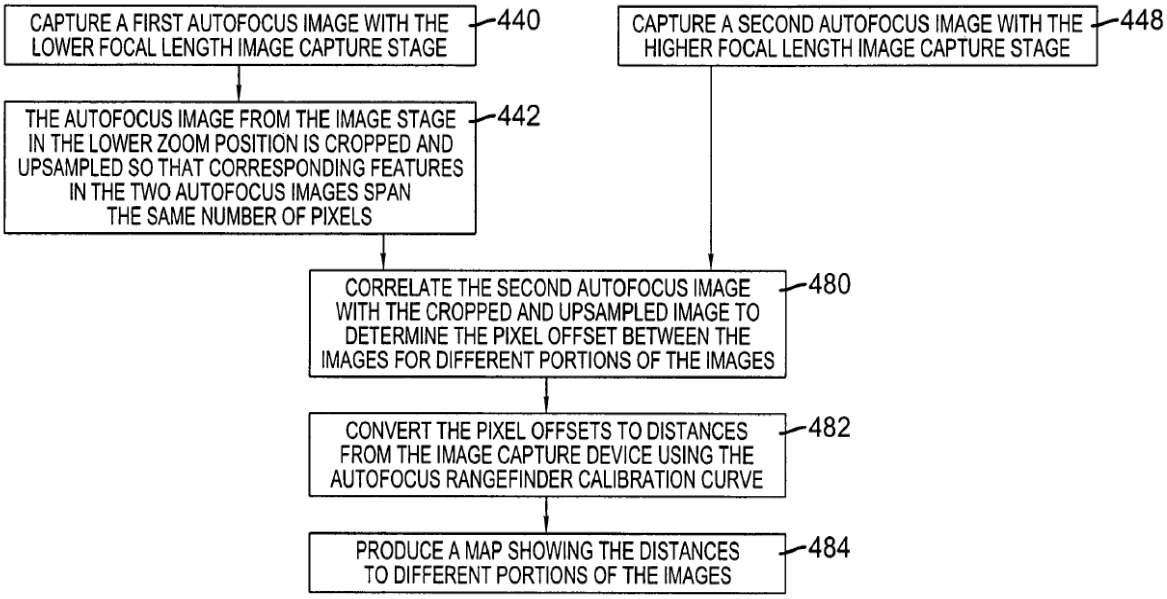


***FIG. 11***

Figure 11 is a flow chart showing a method for processing images captured with a two-lens camera to generate a distance or range map. *Id.* at 19:49–51. At step 440, "a first autofocus image is captured with the lower focal length image capture stage," e.g., lens 3 and image sensor 12. *Id.* at 20:1–3. At step 442, this image is "cropped and upsampled so that corresponding features in the two autofocus images span the same number of pixels." *Id.* at 20:3–6. At step 448, "a second autofocus image is captured with the higher focal length image capture stage," e.g., lens 4 and image sensor 14. *Id.* at 20:6–8. At step 480, "the second autofocus image is correlated with the cropped and upsampled image to determine the pixel offset between the images for different portions of the images." *Id.* at 20:8–11. At step 482, these pixel offsets are "converted . . . to distances from the image capture device using the autofocus rangefinder calibration curve." *Id.* at 20:11–14. Finally, at step 484, a distance or range map is produced "showing the distances to different portions of the images." *Id.* at 20:14–15.

Parulski's range map can be "used to modify the captured image signal or the output image for a variety of purposes," including "to enable dynamic depth of field images by blurring of portions of the image that correspond to areas of the scene that lie outside of the desired depth of field." *Id.* at 20:51–53, 20:63–65. For example, the range map can be used to modify a picture having a dog in the foreground, a field of flowers in the mid-ground, and a mountain range in the background. *Id.* at 21:7–17. "[I]f the user really wants to emphasize the dog more than the beautiful scenery, the range data can be used to isolate the mountains and the flowers, which can then be blurred." *Id.* at 21:27–30.

*2. Konno*

Konno discloses "an imaging apparatus . . . [that] includes single-focus first and second imaging optical systems that face the same direction." Ex. 1015 ¶ 7. Such a system is shown, for example, in Figure 21 of Konno, which is reproduced below.

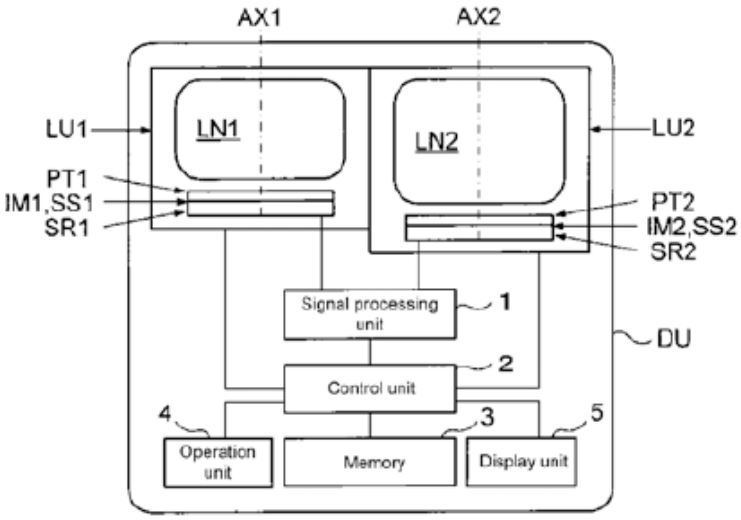


Figure 21 of Konna is "a schematic view . . . of digital equipment [e.g., a digital camera] including first and second imaging optical units." *Id.* ¶ 18. The digital camera includes optical units LU1 and LU2, which include

"single-focus first and second imaging optical systems [i.e., lenses] LN1 and LN2 . . . for forming optical images" and "first and second imaging devices [i.e., sensors] SR1 and SR2 for converting the optical images . . . into electrical signals." *Id.* ¶ 48. The camera also includes "a signal processing unit 1, a control unit 2, a memory 3, an operation unit 4, and a display unit 5." *Id.* ¶ 54. Control unit 2 "controls various functions including . . . a lens moving mechanism." *Id.* "[T]he first and second imaging optical systems [i.e., lenses] LN1 and LN2 have different focus movements in the case of whole feeding." *Id.* ¶ 50. Various characteristics of lenses LN1 and LN2 (e.g., focal length, lens length, field of view) are disclosed in Table 1 of Konno. *Id.* ¶ 76.

*3. Reasons to Combine*

Petitioner argues that it would have been obvious to combine the teachings of Parulski and Konno because "Parulski does not provide lens prescription data for either the first [wide] or second [tele] fixed-focus lenses in its cell phone" camera. Pet. 16. Thus, Petitioner argues, a skilled artisan "would have looked to Konno which provides a fixed-focal length, dual-lens system designed for digital equipment like cell phones." *Id.* at 16–17 (citing Ex. 1003 ¶ 57). Petitioner argues a person skilled in the art would have looked to Konno for lens prescription data because "Konno's system offers fixed-focal length wide and telephoto lenses in a thin format for incorporation in a mobile device," and "Parulski teaches the importance of keeping the 'z' dimension (i.e., thickness) of its cell phone embodiment small." *Id.* at 17; Ex. 1005, 24:20–27; Ex. 1015 ¶ 46. Patent Owner does not dispute these contentions. *See* PO Resp. 26–35.

We find Petitioner sets forth sufficient reasoning with rational underpinning to combine the teachings of Parulski and Konno. Parulski

teaches a cell phone having a dual-lens camera and the need to have thin lenses, but fails to give lens prescription data for the two camera lenses. Konno discloses lens prescription data for a dual-lens camera utilizing two thin lenses. The combination, therefore, is one of familiar elements according to known methods to obtain predictable results or a substitution of one element for another known in the field to obtain a predictable result. *See KSR Int'l Co. v. Teleflex, Inc*., 550 U.S. 398, 416 (2007).

*4. Claims 1 and 23*

Claim 1 recites a dual-aperture digital camera having a Wide camera for providing a Wide image, a Tele camera for providing a Tele image, and a camera controller configured to process the Wide and Tele images to create a fused image. Ex. 1001, 13:22–34, 13:40–46. Claim 23 recites a method for acquiring a Wide image with a Wide sensor and a Tele image with a Tele sensor, and processing the Wide and Tele images to create a fused image. *Id.* at 15:49–64.

Figure 16A of Parulski discloses a dual-aperture camera having an assembly 610 that includes "a first fixed focal length lens 612 and a first image sensor 614, and a second fixed focal length lens 616 and a second image sensor 618," where "[t]he first lens 612 [is] preferably a fixed focal length wide angle lens . . . and the second lens 616 [is] preferably a fixed focal length telephoto lens." Ex. 1005, 23:28-40. Figure 14 of Parulski discloses "a method for enhancing the depth of field of an image by using images from both image capture stages," i.e., from the wide and tele lenses. *Id.* at 22:14–16. After capturing images from each of the wide and telephoto lenses, Parulski "*combine[s]* [them] into a modified image with a broadened depth of field." *Id.* at 28:45–53 (emphasis added).

Claim 1 further requires the camera controller to create and output the fused image with a point of view (POV) of the Wide camera by mapping Tele image pixels to matching pixels in the Wide image. Ex. 1001, 13:46–50. Claim 23 further requires the method of creating a fused image to include outputting the fused image with a point of view (POV) of the Wide camera by mapping Tele image pixels to matching pixels within the Wide image. *Id.* at 15:65–67.

To meet these limitations, Petitioner relies on several different disclosures in Parulski. *See* Pet. 26–30, 39, 40. For example, Parulski discloses modifying the depth of field of an image containing a dog in the foreground, a field of flowers in the mid-ground, and a snow-capped mountain in the background so that "the dog is in focus, the mountains are in focus and so are those great flowers." Ex. 1005, 21:9–13, 21:25–27. This is be done by combining information from two images, where one image "is captured . . . at one focus position [e.g., wide angle] and another image is captured . . . at another focus position [e.g., tele photo]." *Id.* at 28:45–53. The information to be combined can be obtained from the wide and tele images using a range map, which "improve[s] object identification within [an] image by identifying the continuous boundaries of the object so [its] shape . . . can be defined" and "enable[s] object extraction from an image by identifying the continuous boundaries of the object so it can be segmented within the image." *Id.* at 20:51–59. Petitioner argues that from these disclosures a person skilled in the art:

> would have understood that creating an enhanced image with both the mountains and the dog in focus would have meant that the pixel[s] corresponding to the dog from the telephoto image would have been identified by the range mapping process and then fused with the corresponding pixels in the wide image so

> that the dog would be sharpened in the wide image while maintaining the mountains in focus, thus broadening the wide image's depth of field.

Pet. 28 (citing Ex. 1003 ¶ 50).

Petitioner further argues Parulski's image fusing process maps Tele image pixels with matching pixels within the Wide image, as required by claims 1 and 23, because "Parulski's range map is generated by matching pixels from the telephoto image to matching pixels in the wide image." *Id.* at 30 (citing Ex. 1005, 20:1–15). Moreover, Petitioner argues, a person skilled in the art "would have understood that fusing portions of the telephoto image with the wide image . . . would have otherwise maintained the wide image, therefore outputting a fused image with the wide image's field of view." *Id.* at 29 (citing Ex. 1003 ¶¶ 50–51). That is, Petitioner argues that identifying and extracting pixels corresponding to the dog from the Tele image and fusing them with pixels corresponding to the dog from the Wide image would generate a fused image having the point of view (POV) of the Wide image because the resulting image would have the field of view (FOV) of the Wide image.

Patent Owner argues that Petitioner and Dr. Durand have failed to demonstrate that Parulski teaches "the 'fused image with a point of view (POV) of the Wide camera' limitation" because their "sole argument that Parulski meets this limitation is based on the output [image] having the 'wide image's field of view.'" PO Resp. 29 (citing Ex. 1003 ¶ 51). Patent Owner further argues that "[n]othing in Parulski suggests that whatever image data from the tele image that might be 'fused' into the output would be modified to have the shapes and positions from the wide image POV" and "nothing in Dr. Durand's declaration even attempts to establish [that] this

would be true." *Id.* at 30. Lastly, Patent Owner argues that Dr. Durand admitted during his deposition that he had not provided an opinion about whether Parulski generates a fused image having both a Wide perspective POV and a Wide position POV. *See* PO Sur-Reply 5 (citing Ex. 2041, 52:25–54:20).

We agree with Patent Owner. As we explain in § II.D.1, *supra,* claims 1 and 23 require generating a fused image having a Wide perspective POV and a Wide position POV. Petitioner's only argument for how the combination of Parulski and Konno teaches this limitation is Parulski's teaching of generating a fused image having a Wide position POV, i.e., having the field of view (FOV) of the Wide camera. *See* Pet. Reply 13 ("Parulski teaches . . . producing an output image that *maintains the Wide position POV or the field of view* of the Wide camera when the image was captured."). Petitioner fails to demonstrate how Parulski's image fusion method would also maintain the Wide perspective POV as required by independent claims 1 and 23.

Accordingly, for the reasons discussed above, Petitioner has failed to demonstrate by a preponderance of evidence that claims 1 and 23 are unpatentable as obvious over the combination of Parulski and Konno.

*5. Claims 10–14, 16, 18, 32–36, 38, and 40*

Claims 10–14, 16, and 18 depend, either directly or indirectly, from independent claim 1. *See* Ex. 1001, 14:29–44, 50–53, 61–65. Claims 32–36, 38, and 40 depend, either directly or indirectly, from independent claim 23. *Id.* at 16:41–54, 16:59–61, 17:1–4. Accordingly, for the reasons discussed in § II.E.4, *supra*, Petitioner has failed to demonstrate by a preponderance of evidence that claims 10–14, 16, 18, 32–36, 38, and 40 are unpatentable as obvious over the combination of Parulski and Konno.

*F. Grounds 2–4*

Petitioner argues claims 2–4 and 24–26 are unpatentable as obvious over Parulski, Konno, and Szeliski, claims 5–9 and 27–31 are unpatentable as obvious over Parulski, Konno, Szeliski, and Segall, and claims 15 and 37 are unpatentable as obvious over Parulski, Konno, and Stein. *See* Pet. 42–70. Patent Owner disputes this. *See* PO Resp. 31–47.

Claims 2–9 and 15 depend, either directly or indirectly, from independent claim 1. *See* Ex. 1001, 13:51–67, 14:1–28, 14:45–49. Claims 24–31 and 37 depend, either directly or indirectly, from independent claim 23. *Id.* at 16:1–40, 16:55–58. Accordingly, for the reasons discussed in § II.E.4, *supra,* Petitioner has failed to demonstrate by a preponderance of evidence that claims 2–9, 15, 24–31, and 37 are unpatentable as obvious over the combination of Parulski, Konno, and one or more of Szeliski, Segall, and Stein.

## III. CONCLUSION

We have reviewed the Petition, Patent Owner Response, Petitioner Reply, and Patent Owner Sur-Reply. We have considered all of the evidence and arguments presented by Petitioner and Patent Owner, and have weighed and assessed the entirety of the evidence as a whole. We find, on this record, Petitioner has failed to demonstrate by a preponderance of evidence that claims 1–16, 18, 23–38, and 40 of the '479 patent are unpatentable.

| Claims | 35 U.S.C. § | Reference(s) /Basis | Claims Shown Unpatentable | Claims Not Shown Unpatentable |
|---|---|---|---|---|
| 1, 10–14, 16, 18, 23, 32–36, 38, 40 | 103(a) | Parulski, Konno | | 1, 10–14, 16, 18, 23, 32–36, 38, 40 |
| 2–4, 24–26 | 103(a) | Parulski, Konno, | | 2–4, 24–26 |

| | | | | |
|---|---|---|---|---|
| | | Szeliski | | |
| 5–9, 27–31 | 103(a) | Parulski, Konno, Szeliski, Segall | | 5–9, 27–31 |
| 15, 37 | 103(a) | Parulski, Konno, Stein | | 15, 37 |
| **Overall Outcome** | | | | 1–16, 18, 23–38, 40 |

## IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has failed to show on this record that claims 1, 10–14, 16, 18, 23, 32–36, 38, and 40 are unpatentable under 35 U.S.C. § 103(a) over Parulski and Konno; and

FURTHER ORDERED that Petitioner has failed to show on this record that claims 2–4 and 24–26 are unpatentable under 35 U.S.C. § 103(a) over Parulski, Konno, and Szeliski; and

FURTHER ORDERED that Petitioner has failed to show on this record that claims 5–9 and 27–31 are unpatentable under 35 U.S.C. § 103(a) over Parulski, Konno, Szeliski, and Segall; and

FURTHER ORDERED that Petitioner has failed to show on this record that claims 15 and 37 are unpatentable under 35 U.S.C. § 103(a) over Parulski, Konno, and Stein; and

FURTHER ORDERED that this Decision is final, and a party to this proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

FOR PETITIONER:

Michael S. Parsons
Andrew S. Ehmke
Jordan Maucotel
HAYNES & BOONE, LLP
michael.parsons.ipr@haynesboone.com
andy.ehmke.ipr@haynesboone.com
jordan.maucotel@haynesboone.com

FOR PATENT OWNER:

Neil A. Rubin
C. Jay Chung
RUSS AUGUST & KABAT
nrubin@raklaw.com
jchung@raklaw.com

kis